(12) UK Patent Application (19) GB (11) 2 347 480 (13) A

(43) Date of A Publication 06.09.2000

(21) Application No 9904697.1

(22) Date of Filing 02.03.1999

(51) INT CL[7]
F16D 1/02

(52) UK CL (Edition R)
F2U U230 U392

(56) Documents Cited
GB 2276987 A GB 2186342 A GB 1577804 A
GB 0940296 A EP 0694704 A1 EP 0235019 A1

(58) Field of Search
UK CL (Edition Q) F2U , H2A AKLL AKXX AKX1 AKX2
INT CL[6] F16D 1/00 1/02

(71) Applicant(s)
Daniel Chao-Chih Hsieh
17 Junction Road, Wahroonga,
New South Wales 2076, Australia

(72) Inventor(s)
Daniel Chao-Chih Hsieh

(74) Agent and/or Address for Service
Guy Selby-Lowndes
Moonrakers, Durfold Wood, Plaistow,
BILLINGSHURST, West Sussex, RH14 0PL,
United Kingdom

(54) Abstract Title
Motor driving system

(57) In a motor driving system a motor 10 with a drive shaft 12 along a central axis is connected to a transmission system 20 having a holding plate 21 and a transmission shaft 22 along the central axis. The transmission shaft 22 has an end connected to the drive shaft 12 and is supported by a bearing 23 to keep the transmission and drive shafts aligned on the central axis. A projection 13 from a connecting flange 11 of the motor 10 engages in a circular depression 24 in the holding plate 21 of the transmission system 20. Vibrations and noise during operation of the motor are effectively reduced.

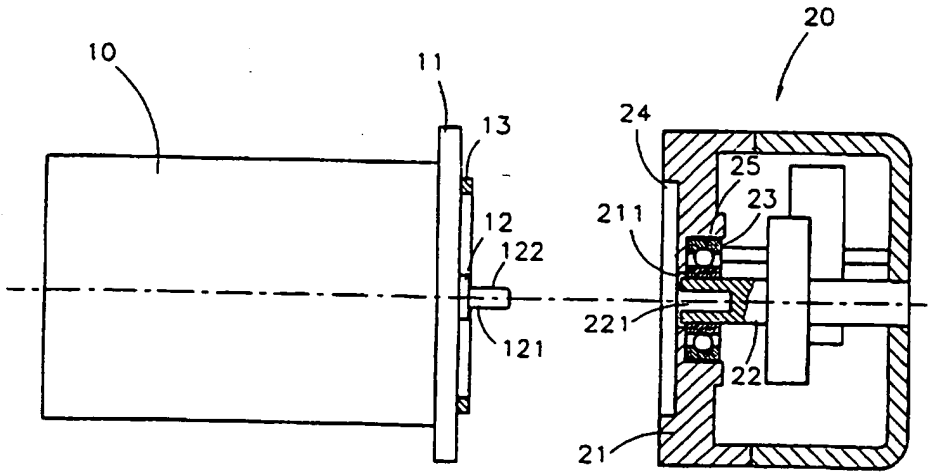


FIG 1

GB 2 347 480

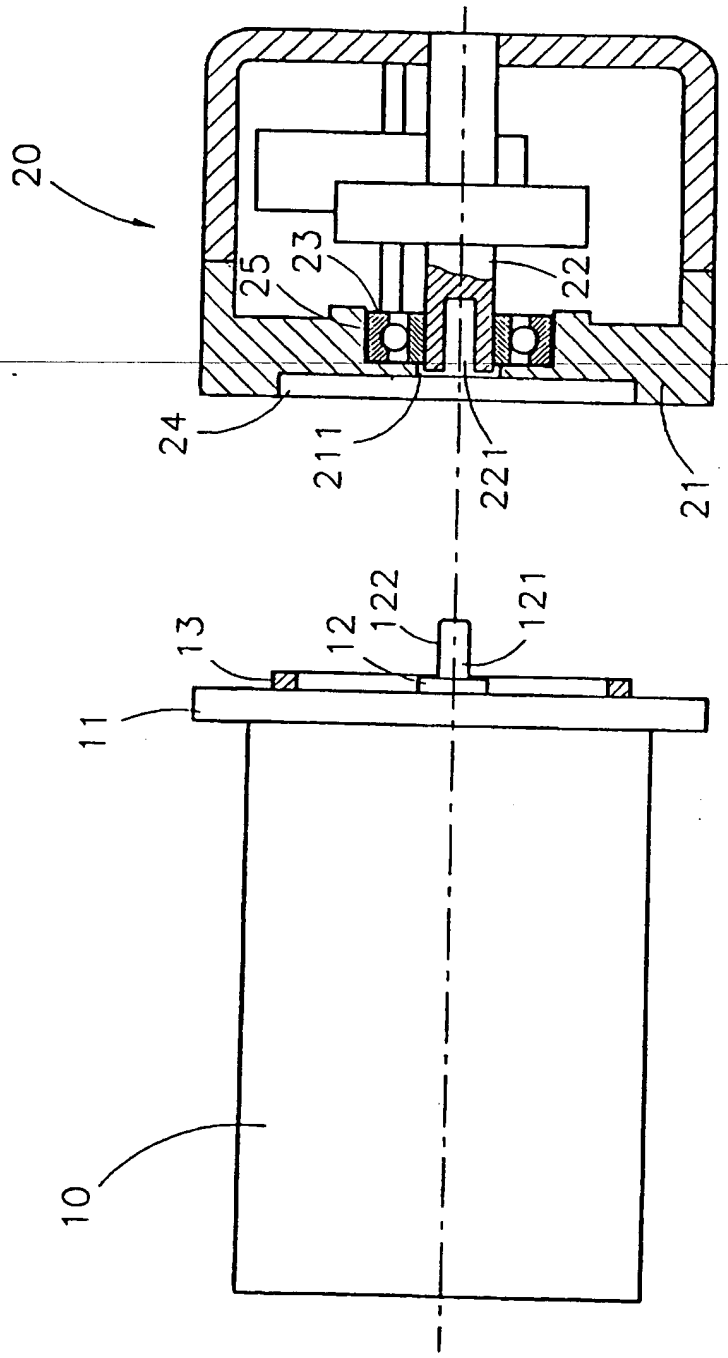


FIG 1

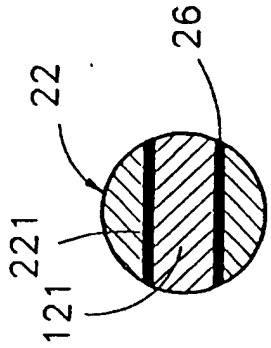


FIG 2B

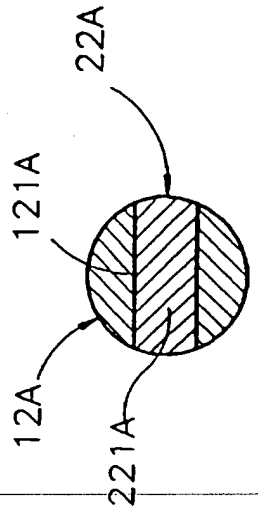


FIG 2C

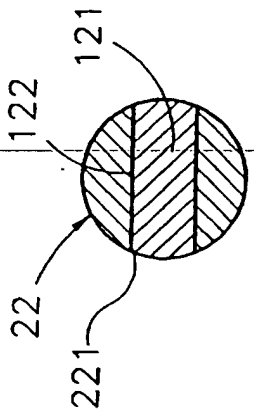


FIG 2A

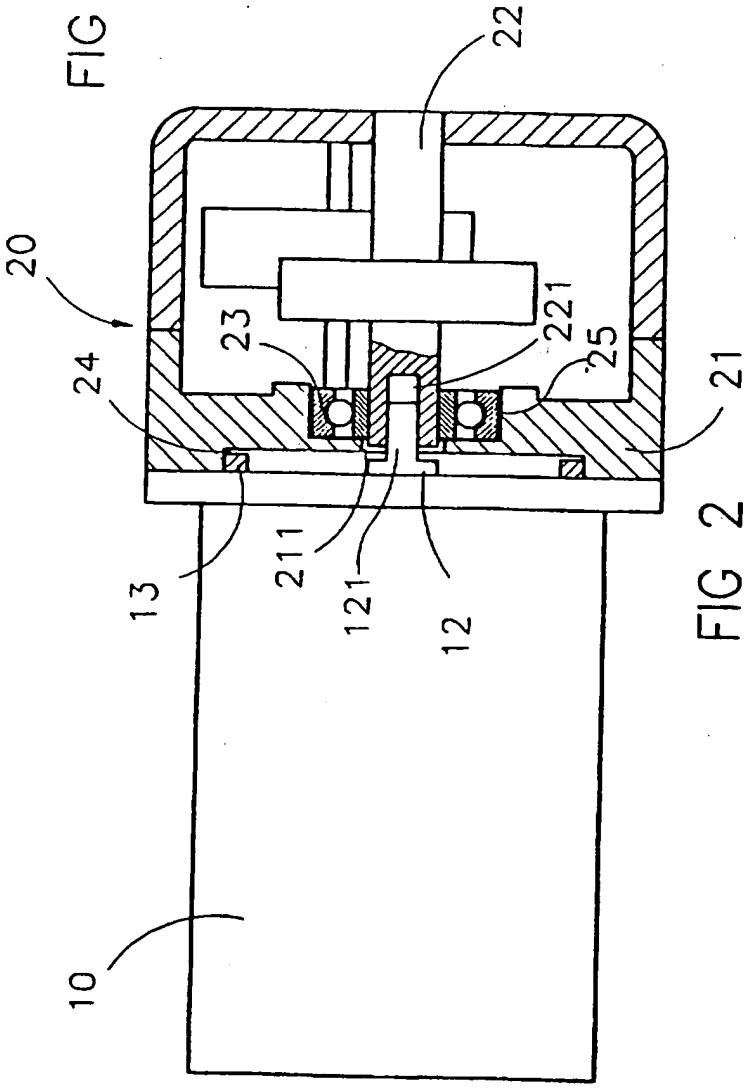
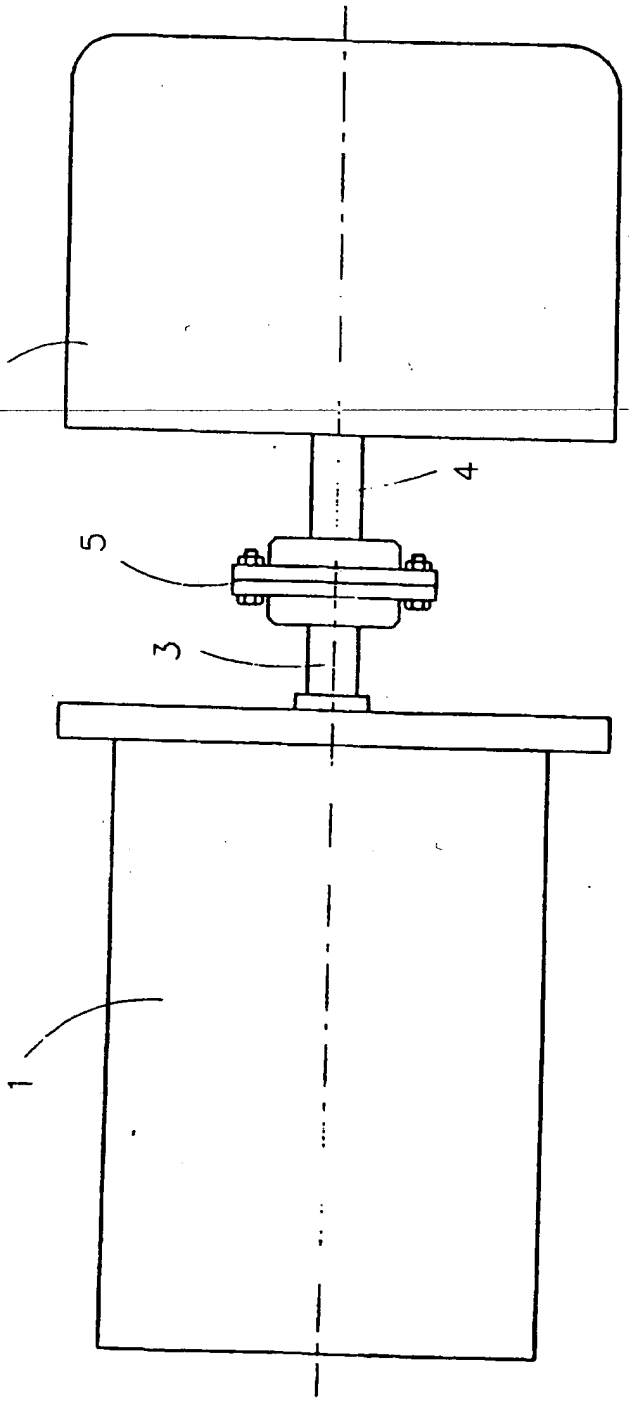


FIG 2



PRIOR ART

FIG 3

MOTOR DRIVING SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a motor driving system, particularly to a motor driving system of simple structure, which reduces vibrations of the drive shaft of the motor.

2. Description of Related Art

Usually a motor delivers power at a high rate of revolutions and low torque. In order to obtain a usable, lower rate of revolutions, a transmission system is employed, which at the same time increases torque.

As shown in Fig. 3, conventionally a motor 1 and a transmission system (or gearbox) 2 separate therefrom are used. The motor 1 has a drive shaft 3, and the transmission system 2 has an transmission shaft 4, which is connected to the drive shaft 3. Since the motor 1 and the transmission system 2 are separate units, the drive shaft 3 and the transmission shaft 4 are basically not exactly aligned, and there will be a small eccentricity with respect to each other. With a considerable length of the drive shaft 3 and the transmission shaft 4 vibrations occur easily.

Therefore a lengthened drive shaft for the motor has been devised, which is directly connected to the gears of the transmission system. This arrangement, however, exposes the g ars of the transmission system

directly to vibrations of the drive shaft, such that they are easily damaged.

In a conventional setup, vibrations between the drive shaft 3 and the transmission shaft 4 not only generate noise, but also lead to fatigue of the drive shaft 3. In order to eliminate the effect of misalignment between the drive shaft 3 and the transmission shaft 4 and of subsequent vibrations, a flexible connector 5, inserted between the drive shaft 3 and the transmission shaft 4, has been used as an absorbing element.

Many types of flexible connectors have appeared on the market, but all of them have a complicated structure, leading to increased costs, nevertheless still need higher precision. Furthermore, the additional flexible connector 5 between the drive shaft 3 and the transmission shaft 4 requires extra space, so does not allow for a compact design of motor 1 and transmission system 2.

SUMMARY OF THE INVENTION

The main object of the present invention is to provide a motor driving system, in which misalignment between the drive shaft of the motor and the transmission shaft of the transmission system is minimized without the need of a connector.

Another object of the present invention is to provide a motor driving system of simple structure.

A further object of the present invention is to provide a motor driving system of little space requirement, allowing for a small distance between the motor and the transmission system.

The present invention can be more fully understood by reference to the following description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of the motor and the transmission system of the present invention, separated from each other.

Fig. 2 is a sectional view of the motor and the transmission system of the present invention, connected to each other.

Fig. 2A is a cross-sectional view of the drive shaft and the transmission shaft of the present invention.

Fig. 2B is a cross-sectional view of the drive shaft and the transmission shaft of the present invention in another embodiment.

Fig. 2C is a cross-sectional view of the drive shaft and the transmission shaft of the present invention in a further embodiment.

Fig. 3 is a schematic illustration of a conventional motor and transmission system.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in Fig. 1, the motor driving system of the present invention mainly comprises a motor 10 and a transmission system 20. The motor 10 has a front side, where a connecting flange 11 is attached, with a central axis passing through the front side. A drive shaft 12 runs along the central axis, having a front section 121 projecting from the front side of the motor 10. The transmission system 20 has a rear side, facing the front side of the motor 10, with a holding plate 21 and a transmission shaft 22 along the central axis, which is connected to the drive shaft 12.

Referring to Fig. 2, a hole 211, concentric with the central axis, is bored through the holding plate 21 for accommodating the front end 121 of the output shaft 12, allowing it to connect to the transmission shaft 22. The holding plate 21 is fastened to the connecting flange 11. As shown in Figs. 1 and 2, from the front side of the connecting flange 11 a ring-shaped positioning projection 13 extends outward. The holding plate 21 has on its rear side a circular depression 24 with a periphery, into which the positioning projection 13 fits for positioning the motor 10 and the transmission system 20 relative to each other without further need for correction.

Referring to Fig. 2A, the front section 121 of the drive shaft 12 is not circular, but flattened with at least one flat surface 122. The transmission shaft 22 has a rear end with an opening 221 with the same cross-

section as the front section 121 of the drive shaft 12. Therefore the front section 121 fits into the opening 221, and a rotary movement of the drive shaft 12 is transmitted to the transmission shaft 22.

Referring to Fig. 2C, in another embodiment of the present invention, a drive shaft 12A with an opening 121A on the front end thereof and a transmission shaft 22A with a flattened rear section 221A are employed. The rear section 221A of the transmission shaft 22A fits into the opening 121A of the drive shaft 12A and is thus taken along with a rotary movement of the drive shaft 12A.

An important characteristic of the present invention is that the transmission shaft 22 of the transmission system 20 is short, completely vanishing therein. The hole 211 is on one side widened to a circular depression 25, into which a bearing 23 for the transmission shaft 22 is laid, ensuring that the transmission shaft 22 remains along the central axis. The bearing 23 effectively prevents lateral and angular deviations of the transmission shaft 22 from the central axis and thus does not allow vibrations and noise to develop.

The surfaces of the connecting flange 11 and the holding plate 21 are connected, leaving no space between the motor 10 and the transmission system 20. Only the front section 121 of the drive shaft 12 projects from the front side of the motor 10. Thus any vibrations of the drive shaft 12 are minimized.

For further reduction of vibrations, the present invention in a further embodiment, as shown in Fig. 2B,

has additional absorbing material 26 between the at least one flat surface 122 of the drive shaft and the corresponding surface in the opening 221 for absorbing vibrations between the drive shaft 12 and the transmission shaft 22.

The structure of the present invention allows to reduce the combined length of the drive shaft 12 and the transmission shaft 22. The bearing 23 stably positions the transmission shaft 22 and thus the connection thereof to the drive shaft 12 on the central axis, preventing any lateral or angular deviations therefrom. Thus vibrations and noise are minimized, and material fatigue will not set in.

At the same time, a connector between the drive shaft 12 and the transmission shaft 22 is not required. Therefore the structure of the present invention is simple, with low costs, and the motor 10 and the transmission system 20 can be placed next to each other to save space.

While the invention has been described with reference to preferred embodiments thereof, it is to be understood that modifications or variations may be easily made without departing from the spirit of this invention which is defined by the appended claims.

1. A motor driving system, comprising:

a motor with a front side and a drive shaft along a central axis; and

a transmission system, having a holding plate for connecting to said front side of said motor and a transmision shaft along said central axis, which has a rear end connected to said drive shaft to be driven thereby and which is supported by a bearing at said rear end, such that said transmission shaft and said drive shaft are kept aligned on said central axis.

2. The motor driving system as claimed in claim 1, wherein said motor on said front end thereof has a connecting flange, on which said holding plate is mounted, said connecting flange and said holding plate having mutually engaging connecting elements for positioning said motor and said transmission system relative to each other.

3. Motor driving systems as claimed in claim 1 and as herein described.

4. Motor driving systems as herein described and illlustrated with reference to Figures 1, 2A, 2B and 2C of the accompanying drawings.

The Patent Office

INVESTOR IN PEOPLE

Application No: GB 9904697.1
Claims searched: 1 - 4

Examiner: C J Duff
Date of search: 6 August 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): F2U; H2A(AKLL, AKX1, AKX2, AKXX)

Int Cl (Ed.6): F16D 1/00, 1/02

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2276987 A	(KOITO) Fig 1	
X	GB 2186342 A	(JOHNSON) Figs 1, 2, 3	1
A	GB 1577804	(YOSHIDA) Fig 1	
X	GB 0940296	(PLESSEY) Whole document	1, 2
A	EP 0694704 A1	(NACAM) Fig 7	
A	EP 0235019 A1	(FOREST-LINE) Fig 1	

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family
A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.